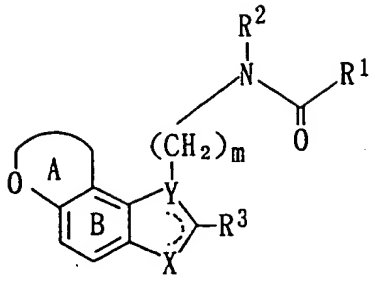
We claim:

1. A compound of the formula:



wherein R^1 represents an optionally substituted hydrocarbon group, an optionally substituted amino group or an optionally substituted heterocyclic group;
R^2 represents a hydrogen atom or an optionally substituted hydrocarbon group;
R^3 represents a hydrogen atom, an optionally substituted hydrocarbon group, or an optionally substituted heterocyclic group;
X represents CHR^4, NR^4, O or S in which R^4 represents a hydrogen atom or an optionally substituted hydrocarbon group;
Y represents C, CH or N, provided that when X is CH_2, Y is C or CH;
..... represents a single bond or a double bond;
ring A represents an optionally substituted, 5- to 7-membered oxygen-containing heterocyclic ring;
ring B represents an optionally substituted benzene ring; and
m represents an integer of 1 to 4,
or a salt thereof.

2. A compound as claimed in claim 1, wherein R^1 is (i) a C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-6} cycloalkyl or C_{6-14} aryl group which may be substituted by 1 to 5 substituents selected from the group consisting of a halogen, nitro, cyano, hydroxy, an

optionally halogenated C_{1-6} alkyl, C_{1-6} alkoxy, amino, mono-C_{1-6} alkylamino, di-C_{1-6} alkylamino, carboxyl, C_{1-6} alkyl-carbonyl, C_{1-6} alkoxy-carbonyl, carbamoyl, mono-C_{1-6} alkylcarbamoyl, di-C_{1-6} alkylcarbamoyl, C_{6-10} aryl-carbamoyl, C_{6-10} aryl, C_{6-10} aryloxy and an optionally halogenated C_{1-6} alkyl-carbonylamino,

(ii) an amino group which may be substituted by 1 or 2 substituents selected from the group consisting of a C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-6} cycloalkyl and C_{6-14} aryl group, each of which may be substituted by 1 to 5 substituents selected from the group consisting of a halogen, nitro, cyano, hydroxy, an optionally halogenated C_{1-6} alkyl, C_{1-6} alkoxy, amino, mono-C_{1-6} alkylamino, di-C_{1-6} alkylamino, carboxyl, C_{1-6} alkyl-carbonyl, C_{1-6} alkoxy-carbonyl, carbamoyl, mono-C_{1-6} alkyl-carbamoyl, di-C_{1-6} alkyl-carbamoyl, C_{6-10} aryl-carbamoyl, C_{6-10} aryl, C_{6-10} aryloxy and an optionally halogenated C_{1-6} alkyl-carbonylamino, or

(iii) a 5- to 14-membered heterocyclic group containing, besides carbon atoms, 1 to 3 hetero atoms selected from nitrogen atom, oxygen atom and sulfur atom, which group may be substituted by 1 to 5 substituents selected from the group consisting of a halogen, C_{1-6} alkyl, C_{3-6} cycloalkyl, C_{2-6} alkynyl, C_{2-6} alkenyl, C_{7-11} aralkyl, C_{6-10} aryl, C_{1-6} alkoxy, C_{6-10} aryloxy, formyl, C_{1-6} alkyl-carbonyl, C_{6-10} aryl-carbonyl, formyloxy, C_{1-6} alkyl-carbonyloxy, C_{6-10} aryl-carbonyloxy, carboxyl, C_{1-6} alkoxy-carbonyl, C_{7-11} aralkyloxy-carbonyl, carbamoyl, an optionally halogenated C_{1-4} alkyl, oxo, amidino, imino, amino, mono-C_{1-4} alkylamino, di-C_{1-4} alkylamino, 3- to 6-membered cyclic amino, C_{1-3} alkylenedioxy, hydroxy, nitro, cyano, mercapto, sulfo, sulfino, phosphono, sulfamoyl, mono-C_{1-6} alkylsulfamoyl, di-C_{1-6}

alkylsulfamoyl, C_{1-6} alkylthio, C_{6-10} arylthio, C_{1-6} alkylsulfinyl, C_{6-10} arylsulfinyl, C_{1-6} alkylsulfonyl and C_{6-10} arylsulfonyl;

R^2 is (i) a hydrogen atom or (ii) a C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-6} cycloalkyl or C_{6-14} aryl group which may be substituted by 1 to 5 substituents selected from the group consisting of a halogen, nitro, cyano, hydroxy, an optionally halogenated C_{1-6} alkyl, C_{1-6} alkoxy, amino, mono-C_{1-6} alkylamino, di-C_{1-6} alkylamino, carboxyl, C_{1-6} alkyl-carbonyl, C_{1-6} alkoxy-carbonyl, carbamoyl, mono-C_{1-6} alkyl-carbamoyl, di-C_{1-6} alkyl-carbamoyl, C_{6-10} aryl-carbamoyl, C_{6-10} aryl, C_{6-10} aryloxy and an optionally halogenated C_{1-6} alkyl-carbonylamino;

R^3 is (i) a hydrogen atom, (ii) a C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-6} cycloalkyl or C_{6-14} aryl group which may be substituted by 1 to 5 substituents selected from the group consisting of a halogen, nitro, cyano, hydroxy, an optionally halogenated C_{1-6} alkyl, C_{1-6} alkoxy, amino, mono-C_{1-6} alkylamino, di-C_{1-6} alkylamino, carboxyl, C_{1-6} alkyl-carbonyl, C_{1-6} alkoxy-carbonyl, carbamoyl, mono-C_{1-6} alkyl-carbamoyl, di-C_{1-6} alkyl-carbamoyl, C_{6-10} aryl-carbamoyl, C_{6-10} aryl, C_{6-10} aryloxy and an optionally halogenated C_{1-6} alkyl-carbonylamino or (iii) a 5- to 14-membered heterocyclic group containing, besides carbon atoms, 1 to 3 hetero atoms selected from nitrogen atom, oxygen atom and sulfur atom, which group may be substituted by 1 to 5 substituents selected from the group consisting of a halogen, C_{1-6} alkyl, C_{3-6} cycloalkyl, C_{2-6} alkynyl, C_{2-6} alkenyl, C_{7-11} aralkyl, C_{6-10} aryl, C_{1-6} alkoxy, C_{6-10} aryloxy, formyl, C_{1-6} alkyl-carbonyl, C_{6-10} aryl-carbonyl, formyloxy, C_{1-6} alkyl-carbonyloxy, C_{6-10} aryl-carbonyloxy, carboxyl, C_{1-6} alkoxy-carbonyl, C_{7-11}

aralkyloxy-carbonyl, carbamoyl, an optionally halogenated C_{1-4} alkyl, oxo, amidino, imino, amino, mono-C_{1-4} alkylamino, di-C_{1-4} alkylamino, 3- to 6-membered cyclic amino, C_{1-3} alkylenedioxy, hydroxy, nitro, cyano, mercapto, sulfo, sulfino, phosphono, sulfamoyl, mono-C_{1-6} alkylsulfamoyl, di-C_{1-6} alkylsulfamoyl, C_{1-6} alkylthio, C_{6-10} arylthio, C_{1-6} alkylsulfinyl, C_{6-10} arylsulfinyl, C_{1-6} alkylsulfonyl and C_{6-10} arylsulfonyl;

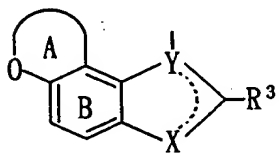
R^4 is (i) a hydrogen atom or (ii) a C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-6} cycloalkyl or C_{6-14} aryl group which may be substituted by 1 to 5 substituents selected from the group consisting of a halogen, nitro, cyano, hydroxy, an optionally halogenated C_{1-6} alkyl, C_{1-6} alkoxy, amino, mono-C_{1-6} alkylamino, di-C_{1-6} alkylamino, carboxyl, C_{1-6} alkyl-carbonyl, C_{1-6} alkoxy-carbonyl, carbamoyl, mono-C_{1-6} alkyl-carbamoyl, di-C_{1-6} alkyl-carbamoyl, C_{6-10} aryl-carbamoyl, C_{6-10} aryl, C_{6-10} aryloxy and an optionally halogenated C_{1-6} alkyl-carbonylamino;

ring A is a 5- to 7-membered heterocyclic group optionally containing, besides carbon atoms and an oxygen atom, 1 to 3 hetero atoms selected from nitrogen atom, oxygen atom and sulfur atom, which group may be substituted by 1 to 4 substituents selected from the group consisting of (i) a C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-6} cycloalkyl or C_{6-14} aryl group which may be substituted by 1 to 5 substituents selected from the group consisting of a halogen, nitro, cyano, hydroxy, an optionally halogenated C_{1-6} alkyl, C_{1-6} alkoxy, amino, mono-C_{1-6} alkylamino, di-C_{1-6} alkylamino, carboxyl, C_{1-6} alkyl-carbonyl, C_{1-6} alkoxy-carbonyl, carbamoyl, mono-C_{1-6} alkyl-carbamoyl, di-C_{1-6} alkyl-carbamoyl, C_{6-10} aryl-carbamoyl, C_{6-10} aryl, C_{6-10} aryloxy and an optionally

halogenated C_{1-6} alkyl-carbonylamino, (ii) a halogen, (iii) C_{1-6} alkoxy, (iv) C_{6-10} aryloxy, (v) formyl, (vi) C_{1-6} alkyl-carbonyl, (vii) C_{6-10} aryl-carbonyl, (viii) formyloxy, (ix) C_{1-6} alkyl-carbonyloxy, (x) C_{6-10} aryl-carbonyloxy, (xi) carboxyl, (xii) C_{1-6} alkoxy-carbonyl, (xiii) C_{7-11} aralkyloxy-carbonyl, (xiv) carbamoyl, (xv) an optionally halogenated C_{1-4} alkyl, (xvi) oxo, (xvii) amidino, (xviii) imino, (xix) amino, (xx) mono-C_{1-4} alkylamino, (xxi) di-C_{1-4} alkylamino, (xxii) 3- to 6-membered cyclic amino, (xxiii) C_{1-3} alkylenedioxy, (xxiv) hydroxy, (xxv) nitro, (xxvi) cyano, (xxvii) mercapto, (xxviii) sulfo, (xxix) sulfino, (xxx) phosphono, (xxxi) sulfamoyl, (xxxii) mono-C_{1-6} alkylsulfamoyl, (xxxiii) di-C_{1-6} alkylsulfamoyl, (xxxiv) C_{1-6} alkylthio, (xxxv) C_{6-10} arylthio, (xxxvi) C_{1-6} alkylsulfinyl, (xxxvii) C_{6-10} arylsulfinyl, (xxxviii) C_{1-6} alkylsulfonyl and (xxxix) C_{6-10} arylsulfonyl; and
ring B is a benzene ring which may be substituted by 1 or 2 substituents selected from the group consisting of (i) a halogen, (ii) a C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-6} cycloalkyl or C_{6-14} aryl group which may be substituted by 1 to 5 substituents selected from the group consisting of a halogen, nitro, cyano, hydroxy, an optionally halogenated C_{1-6} alkyl, C_{1-6} alkoxy, amino, mono-C_{1-6} alkylamino, di-C_{1-6} alkylamino, carboxyl, C_{1-6} alkyl-carbonyl, C_{1-6} alkoxy-carbonyl, carbamoyl, mono-C_{1-6} alkyl-carbamoyl, di-C_{1-6} alkyl-carbamoyl, C_{6-10} aryl-carbamoyl, C_{6-10} aryl, C_{6-10} aryloxy and an optionally halogenated C_{1-6} alkyl-carbonylamino,
(iii) an amino group which may be substituted by 1 or 2 substituents selected from the group consisting of a C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-6} cycloalkyl and C_{6-14} aryl group, each of which may be substituted by 1 to 5 substituents selected from the group consisting of

a halogen, nitro, cyano, hydroxy, an optionally halogenated C_{1-6} alkyl, C_{1-6} alkoxy, amino, mono-C_{1-6} alkylamino, di-C_{1-6} alkylamino, carboxyl, C_{1-6} alkyl-carbonyl, C_{1-6} alkoxy-carbonyl, carbamoyl, mono-C_{1-6} alkyl-carbamoyl, di-C_{1-6} alkyl-carbamoyl, C_{6-10} aryl-carbamoyl, C_{6-10} aryl, C_{6-10} aryloxy and an optionally halogenated C_{1-6} alkyl-carbonylamino, (iv) a C_{1-6} alkanoylamino group, (v) a C_{1-6} alkoxy group which may be substituted by 1 to 3 substituents selected from the group consisting of a halogen, nitro, cyano, hydroxy, an optionally halogenated C_{1-6} alkyl, C_{1-6} alkoxy, amino, mono-C_{1-6} alkylamino, di-C_{1-6} alkylamino, carboxyl, C_{1-6} alkyl-carbonyl, C_{1-6} alkoxy-carbonyl, carbamoyl, mono-C_{1-6} alkyl-carbamoyl, di-C_{1-6} alkyl-carbamoyl, C_{6-10} aryl-carbamoyl, C_{6-10} aryl, C_{6-10} aryloxy and an optionally halogenated C_{1-6} alkyl-carbonylamino or (vi) a C_{1-3} alkylenedioxy group.

3. A compound as claimed in claim 1, wherein



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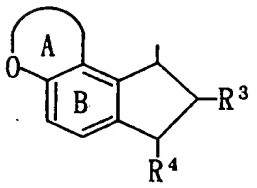

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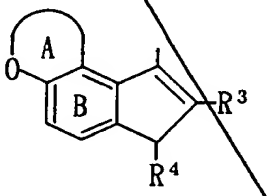

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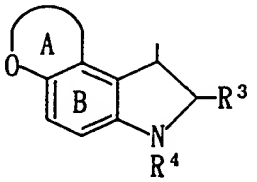
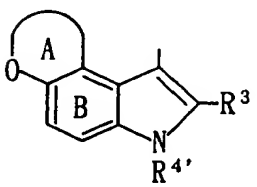


or



wherein $R^{4'}$ is an optionally substituted hydrocarbon group and the other symbols are as defined in claim 1.

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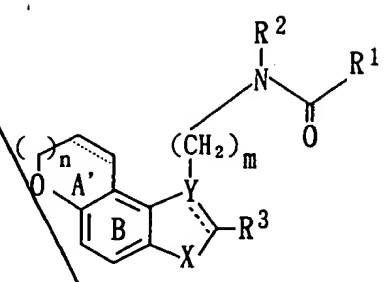
4. A compound as claimed in claim 1 which is a compound of the formula:



wherein ring A' is an optionally substituted, oxygen-containing heterocyclic ring;
n is an integer of 0 to 2;
------ and ..... are the same or different and each is a single bond or a double bond;
and the other symbols are as defined in claim 1.

5. A compound as claimed in claim 1, wherein R^1 is
(i) an optionally substituted C_{1-6} alkyl group,
(ii) an optionally substituted C_{3-6} cycloalkyl group,
(iii) an optionally substituted C_{2-6} alkenyl group,
(iv) an optionally substituted C_{6-14} aryl group,
(v) an optionally substituted mono- or di-C_{1-6} alkylamino group,
(vi) an optionally substituted C_{6-14} arylamino group or
(vii) an optionally substituted 5- or 6-membered nitrogen-containing heterocyclic group.

6. A compound as claimed in claim 1, wherein R^1 is an optionally halogenated C_{1-6} alkyl group.

7. A compound as claimed in claim 1, wherein R^2 is a hydrogen atom or an optionally substituted C_{1-6} alkyl group.

8. A compound as claimed in claim 1, wherein R^2 is a hydrogen atom.

9. A compound as claimed in claim 1, wherein R^3 is a hydrogen atom or an optionally substituted hydrocarbon group.

10. A compound as claimed in claim 1, wherein R^3 is a hydrogen atom.

11. A compound as claimed in claim 1, wherein R^4 is a hydrogen atom or an optionally substituted C_{1-6} alkyl group.

12. A compound as claimed in claim 1, wherein X is CHR^4.

13. A compound as claimed in claim 1, wherein X is CHR^4 and ..... is a single bond.

14. A compound as claimed in claim 13, wherein X is CH_2.

15. A compound as claimed in claim 1, wherein X is NR^4.

16. A compound as claimed in claim 1, wherein Y is C or CH.

17. A compound as claimed in claim 1, wherein Y is CH.

18. A compound as claimed in claim 1, wherein m is 2.

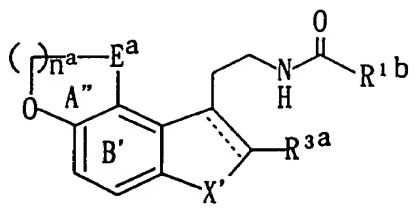
19. A compound as claimed in claim 1, wherein ring A is a tetrahydrofuran ring.

20. A compound as claimed in claim 1, wherein ring A is unsubstituted.

21. A compound as claimed in claim 1, wherein ring B is unsubstituted.

22. A compound as claimed in claim 4, wherein n is 0 or 1.

23. A compound as claimed in claim 1 which is a compound of the formula:



wherein R^{1b} is C_{1-6} alkyl,

X' is CH_2, NH or NCHO,

..... is a single bond or double bond,

R^{3a} is a hydrogen atom or phenyl,
E^a is CH_2CH_2, CH=CH, CH_2O, CH=N, CONH or CH_2NH,
n^a is 0 or 1,
ring A" is a 5- or 6-membered oxgen-containing heterocyclic ring which may be substituted by 1 or 2 C_{1-6} alkyl optionally substituted by a hydroxy, and
ring B' is a benzene ring which may be substituted by a halogen.

24. A compound claimed in claim 23, wherein ..... is single bond and X' is NH.

25. A compound claimed in claim 1, which is (S)-N-[2-(1,6,7,8-tetrahydro-2H-indeno[5,4-b]furan-8-yl)ethyl]propionamide.

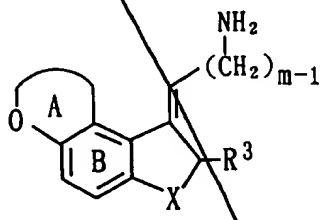
26. A compound claimed in claim 1, which is N-[2-(1,6,7,8-tetrahydro-2H-furo[3,2-e]indol-8-yl)ethyl]propionamide.

27. A compound claimed in claim 1, which is N-[2-(1,6,7,8-tetrahydro-2H-furo[3,2-e]indol-8-yl)ethyl]butyramide.

28. A compound claimed in claim 1, which is N-[2-(7-phenyl-1,6-dihydro-2H-indeno[5,4-b]furan-8-yl)ethyl]propionamide.

29. A compound claimed in claim 1, which is N-[2-(7-phenyl-1,6-dihydro-2H-indeno[5,4-b]furan-8-yl)ethyl]butyramide.

30. A process for producing a compound as claimed in claim 1, which comprises reacting a compound of the formula (i):



wherein all symbols are as defined in claim 1, or (ii):

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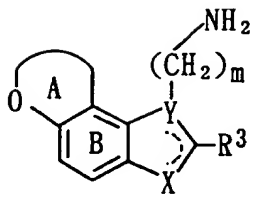
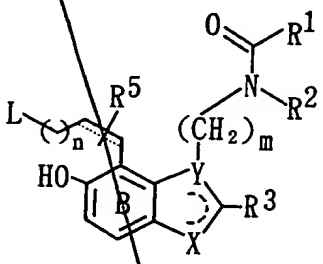


wherein all symbols are as defined in claim 1, or a salt thereof, with a compound of the formula:

R^1COOH

wherein R^1 is as defined in claim 1, or a salt thereof or a reactive derivative thereof, and if necessary, subjecting the resultant compound to reduction and/or alkylation.

31. A process for producing a compound as claimed in claim 4, which comprises subjecting a compound of the formula:



wherein R^5 represents a hydrogen atom, a halogen atom, an optionally substituted hydrocarbon group, an optionally substituted alkoxy group, a hydroxy group, a nitro group, a cyano group or an optionally substituted amino group; L represents a leaving group; and the other symbols are as defined in claim 4, or a salt thereof to cyclization, and if necessary, subjecting the resultant compound to reduction.

32. A compound of the formula:

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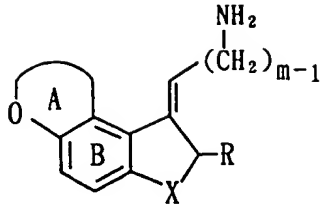
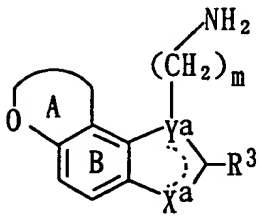


wherein the symbols are as defined in claim 1, or a salt thereof.

33. A compound of the formula:



wherein X^a represents CHR^{4a}, NR^{4a}, O or S in which R^{4a} represents a hydrogen atom or an optionally substituted hydrocarbon group; Y^a represents C, CH or N, provided that when X^a is NH, Y^a is CH or N; and the other symbols are as defined in claim 1, or a salt thereof.

34. A pharmaceutical composition which comprises a compound as claimed in claim 1.

35. A composition as claimed in claim 34 which has a binding affinity for melatonin receptor.

36. A composition as claimed in claim 35 which is a regulating agent of circadian rhythm.

37. A composition as claimed in claim 35 which is a regulating agent of sleep-awake rhythm.

38. A composition as claimed in claim 35 which is a regulating agent of time zone change syndrome.

39. A composition as claimed in claim 35 which is a therapeutic agent of sleep disorders.

40. Method for treating or preventing diseases related to the action of melatonin in mammals which comprises administrating to a subject in need a therapeutically effective amount of a compound as claimed in claim 1

Sub a20 cont'd

and pharmaceutically acceptable carrier.

41. Use of a compound as claimed in claim 1 for manufacturing a pharmaceutical composition for treating or preventing diseases relating to the action of melatonin in mammals.